

# EARLY WARNING SIGNS OF IT PROJECT FAILURE: THE DOMINANT DOZEN

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**The postmortem examination of failed IT projects reveals that long before the failure there were significant symptoms or “early warning signs.” This article describes the top 12 people-related and project-related IT project risks, based on “early warning sign” data collected from a panel of 19 experts and a survey of 55 IT project managers.**

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**T**HE MASTERY OF RISK DISTINGUISHES modern times from the past: By understanding and measuring risks and their consequences, modern humans no longer perceive the future as a whim of the gods and thereby have been empowered to transform their world (Bernstein, 1996). Strangely, IT project management, despite the fact that it deals with “modern” technologies, is embarrassingly immature in the mastery of risks. We see similar recriminating data year after year reminding us that about 20 percent of IT projects are canceled before completion and less than a third are finished on time and within budget with expected functionality (Standish Group, 2004). And if we limit the discussion to larger and therefore riskier projects of 10,000 function points, the cancellation rate more than doubles (Jones, 1995, 2000). Obviously, effective risk management is needed to avoid troubled projects (Tiwana & Keil, 2004) and make aggressive risk taking possible (DeMarco & Lister, 2003).

The postmortem examination of failed IT projects reveals that long before the failure there were significant symptoms or “early warning signs” of trouble. A warning sign is defined as an event or indication that predicts, cautions, or alerts one of possible or impending problems. Early warning signs (EWSs) provide an indication of manifesting risks and

thereby an assessment of a project’s propensity to future difficulties and failure. Keil and Montealegre (2001) recommend that

At the earliest possible stage, managers need to ask themselves whether any “red flags” ... are serious enough to warrant project termination or significant redirection. By institutionalizing such an early warning system, organizations can save considerable sums of money simply by identifying failed projects while they are still in the early stages of development. (p. 65)

This article contributes to our knowledge about IT project management in several ways. First, it focuses on early warning signs, instead of general IT project risks. In our study, to qualify as an early warning sign, the event or indication must occur in the first 20 percent of the project’s initial calendar. Second, this study builds on risks identified from IT project management articles in both the academic literature and practitioner journals, as well as input obtained from experienced IT project managers, to identify the most important EWSs.

Table 1 presents our research methods in more detail. Table 2 shows the mean importance score of the 53 EWSs we identified. They are listed in order from most important to least important, based on the ratings of 55 IT project

**TABLE 1** Detailed Research Methods

The research team first searched the literature extensively to develop a preliminary list of EWSs. The two authors experienced in IT project management then added several EWSs based on their personal experience. Next, 19 IT project management experts were asked to assess the list. On the basis of their feedback, we added new items and modified others to develop a list of 53 EWSs. Finally, the research team invited 138 experienced IT project managers (including the original 19 experts) to participate in rating the 53 EWSs using a scale from 1 (extremely unimportant) to 7 (extremely important). Fifty-five (55) of these managers completed the survey, yielding a response rate of nearly 40 percent. The respondents had an average of more than 15 years of IT project management experience. The budgets of the largest IT projects they managed ranged from 3 million to 7 billion dollars. About 30 percent held the title of program or project manager and nearly 20 percent had consultant titles. Director or program analyst titles accounted for about 15 percent each, 10 percent were vice presidents, and the rest held titles such as CEO, CIO, chief scientist, chief technologist, or partner.

managers who participated in our study. The dozen IT EWSs that emerged as the most important are described in detail in the next section.

### **THE DOMINANT DOZEN EARLY WARNING SIGNS OF IT PROJECT FAILURE**

IT project risks can be grouped into the three general categories of social subsystem risks, project management risks, and technical subsystem risks (Wallace, Keil, & Rai, 2004), or simply *people*, *process*, and *product risks*, respectively. The 53 EWSs of IT project failure listed in Table 2 are no exception. Yet, on examination it appears that the 17 EWSs that were rated above 6 (on a 7-point scale) by our 55 participants belong only to the people and process risk categories. This is not surprising because IT projects almost never fail because of technical causes, despite the fact that people and process problems may manifest technically. Just like most physical maladies can be traced to behavioral and dietary causes that exploit inherent health risks (Kurzweil & Grossman, 2004), the technical ailments of IT projects can be traced to people and process causes that exploit inherent product risks, such as large size, high complexity, or novel technology. Nevertheless, these technical risks can be mitigated with proper people and process practices, just like genetic propensities to certain diseases can be mitigated with proper behavioral and dietary practices. Technical risks cannot be eliminated, but they can be managed.

Further, a careful examination of the 17 risks with a mean score greater than 6 in Table 2 led to the combination of several of these, yielding a final list of the 12 most influential EWSs. These dominant dozen EWSs are shown

in Table 3. Below we describe each of the EWSs in Table 3 in more detail.

### **People-Related EWSs**

The six people-related EWSs of IT project failure center on five not altogether mutually exclusive groups of people: top management, project management, project team members, subject matter experts (SMEs), and stakeholders in general.

*Lack of top management support.* It is not surprising that this is the top-rated EWS because employees tend to focus on activities that their management deems important. Potentially problematic projects include those that get started “from the bottom up” and departmental projects that do not have the required support from across the enterprise. In many cases, IT projects get caught up in enterprise politics where there are fundamental disagreements about overall enterprise priorities. In these cases the resources and enterprise-wide commitment required for success are lacking. Middle managers do not see the project as being important to the enterprise or to their performance evaluations and therefore redirect resources and attention to activities that top management does support.

*Weak project manager.* Project managers who cannot effectively lead or communicate pose a serious risk. Successful analysts or programmers are sometimes promoted to project managers; however, like sales and sales management, the jobs are fundamentally different. The project manager has to plan and coordinate many efforts rather than perform the effort. Effort is almost always required from stakeholders and other staff that do not work for the project manager. These factors point to leadership and communication skills as essential for project management success. “Accidental” project managers that do not have or

**TABLE 2** 53 Early Warning Signs Ranked by Mean Importance Score  
(7 = Extremely Important, 1 = Extremely Unimportant)

Rank	Item Description*	Source	Mean Importance Score
1	Lack of top management support or commitment to the project	Schmidt et al., 2001	6.59
2	Functional, performance, and reliability requirements and scope are not documented	Winters, 2002	6.58
3	Project manager(s) cannot effectively lead the team and communicate with clients	Schmidt et al., 2001	6.38
4	No change control process	Schmidt et al., 2001	6.33
5	Project stakeholders have not been interviewed for project requirements	Ward, 2003	6.32
6	No documented milestone deliverables and due dates		6.30
7	Undefined project success criteria		6.22
8	Project team members have weak commitment to the project scope and schedule	Schmidt et al., 2001	6.17
9	Communication breakdown among project stakeholders	May, 1998	6.17
10	Key project stakeholders do not participate in major review meetings		6.16
11	Project team members do not have required knowledge/skills	Barki et al., 2001	6.16
12	Project resources have been assigned to a higher priority project	Havelka et al., 2004	6.12
13	No business case for the project	Ward, 2003	6.11
14	No project status progress process	Havelka et al., 2004	6.11
15	Schedule deadline not reconciled to the project schedule		6.09
16	Early project delays are ignored — no revision to the overall project schedule	McKeeman, 2001	6.04
17	Subject matter experts are overscheduled: retain all prior duties yet expected to provide substantial participation to the project	McKeeman, 2001	6.04
18	No planning and estimation documentation	Jones, 2004	5.96
19	Project managers have poor training	Schmidt et al., 2001	5.94
20	Key stakeholders do not review and sign off deliverables on a timely basis		5.93
21	Project stakeholder decision delays have caused due dates to be missed		5.93
22	No due diligence on vendor(s) and team members	McKeeman, 2001	5.91
23	No written commitment for the project outside of the project team		5.88
24	Significant goal, scope, or schedule requirements change immediately after project kickoff	Boehm, 1991	5.85
25	Team members have undefined roles and responsibilities	Jiang et al., 2002	5.83
26	No project communications plan or resources devoted to managing and communicating project expectations		5.80
27	Project team members are overscheduled	Schmidt et al., 2001	5.77
28	Users are not willing to cooperate	Schmidt et al., 2001	5.75
29	No team member experience with the chosen technology	Schmidt et al., 2001	5.73
30	No project management methodology	Schmidt et al., 2001	5.67
31	No project charter document at early stage of project		5.65
32	No risk analysis documentation and process	McKeeman, 2001	5.65
33	Failure to gather requirement via joint application design		5.63
34	No documented analysis of business strategy alignment	Winters, 2002	5.61
35	Major new risks are identified after the project kickoff		5.59
36	No performance and reliability requirements metrics tracking process	Jones, 2004	5.57
37	Approved project budget less than budget estimated by the project team		5.56
38	Budget, schedule, scope, and quality all mandated from outside the project team		5.56
39	Project manager(s) have never managed a project of this scale before	McFarlan, 1982	5.55
40	Deliverable due dates missed during the first 10 percent of the project schedule	McKeeman, 2001	5.54
41	IT operations infrastructure and network infrastructure problems have major impact on project team productivity		5.52
42	Difficulty in determining the input and output of the system		5.51
43	Cultural conflict among organizations involved	Winters, 2002	5.50
44	No contingency budget for known risks and rate of changes		5.50
45	Unstable organization environment (such as changes in senior management or restructuring)	Schmidt et al., 2001	5.49
46	Project team member(s) have low morale	McKeeman, 2001	5.48
47	Key team member turnover after project kickoff	Schmidt et al., 2001	5.45
48	Key stakeholders have not signed the project charter		5.36
49	Large number of interfaces to other system required	Barki et al., 2001	5.30
50	Users cannot get involved because of lack of understanding of new system capabilities	McFarlan, 1982	5.29
51	Project involves implementing a custom or beta version of hardware or software	Schmidt et al., 2001	5.10
52	Users or technical support team feel threatened by a project to replace their legacy system	Jiang et al., 2002	4.80
53	Earned value systems not in place or used to control program		4.56

\* The items for which no source is listed were not identified from earlier studies; they were added based on the authors' experiences and on feedback from a panel of 19 experts.

**TABLE 3** The Dominant Dozen Early Warning Signs of IT Project Failure

Dominant Dozen Early Warning Signs	Rankings from Table 2
<b>PEOPLE-RELATED RISKS</b>	
Lack of top management support	1
Weak project manager	3
No stakeholder involvement and/or participation	5, 10
Weak commitment of project team	8
Team members lack requisite knowledge and/or skills	11
Subject matter experts are overscheduled	17
<b>PROCESS-RELATED RISKS</b>	
Lack of documented requirements and/or success criteria	2, 7
No change control process (change management)	4
Ineffective schedule planning and/or management	6, 14, 15, 16
Communication breakdown among stakeholders	9
Resources assigned to a higher priority project	12
No business case for the project	13

cannot apply solid leadership and communication skills cannot realistically be expected to deliver the promised project scope, reliability, and performance on time or on budget.

*No stakeholder involvement and/or participation.* Any project of significance has a number of stakeholders. These stakeholders have to contribute resources if the project is going to succeed and often have to take away resources from lower priority activities to do so. There are always more demands for resources than there are resources available. If all relevant stakeholders are not engaged and committed to project success, it is just about guaranteed the project will not get the resources and attention required to deliver the promised project scope on time and on budget. If key project stakeholders do not participate in major review meetings, it signals they are *not* engaged in the project and therefore the project is not a high priority for them. Other stakeholders soon begin to disengage too. The project manager then finds it harder to get the participation and resources necessary for project success, especially from those who are not full-time members of the project team. Often such project team members get reassigned to other projects that are perceived to be more important. However, the project scope and due date remain fixed. The project falls into a death spiral. Important projects have and keep the attention of major stakeholders.

*Weak commitment of project team.* Delivering the originally promised project scope

with high quality, on time, and on budget requires hard work and hard choices. Project team members with a weak commitment to the project scope and schedule can always find other worthwhile activities to work on. Sponsors may have imposed unrealistic budgets or schedules. The project team may not have the skills and resources they know they need for success. The project objectives may be counter to a project team member's personal interests. Regardless of the reason, weak commitment to success is just about certain to result in being late, going over budget, and/or not delivering the promised scope.

*Team members lack requisite knowledge and/or skills.* More than the other people-related EWSs, this risk directly addresses the team's ability to mitigate product-related risks, such as novel technology or complexity. If the needed skills aren't there to start with, then project management needs to make sure they are acquired.

*Subject matter experts are overscheduled.* It is unrealistic to expect SMEs from the participating business units to be able to provide guidance and requirements to the project team if they continue to retain all their full-time operating responsibilities and workload. Yet success is impossible without the requisite knowledge that only these SMEs can provide about business processes, data, timings, objectives, and rules. SMEs that are not allowed to dedicate adequate time to project teams are a clear EWS of IT project failure.

**P**rojects with undefined success criteria by definition cannot succeed.

### Process-Related EWSs

The six process-related EWSs of IT project failure center on five project management processes and their associated deliverables that are essential to success: requirements (including a business case), change control, schedule, communications, and resources.

*Lack of documented requirements and/or success criteria.* If functional, performance, and reliability requirements are not documented, then each project team member and stakeholder inevitably will have different expectations and assumptions about the project, because each participant is working from a different mental blueprint. Asking for sign-offs on requirements documentation forces differences in expectations and assumptions to the surface where they can be resolved. If everyone is not pulling the oars in the same direction, the project is going to founder. Projects with undefined success criteria by definition cannot succeed. Stakeholders who must provide resources and support for the project will not do so, or will soon withdraw those resources, if the objective and benefits have not been articulated. A project with undefined success criteria is doomed to disappoint.

*No change control process.* From a database of more than 10,000 IT projects, Jones (1995) reports that requirements change at an average rate of 2 percent per month. The team can declare that “requirements are frozen” at the start of the project, but in the real world they change anyway. Competitors change, business processes change, regulations change, laws get passed, market opportunities change, technology changes, and senior management changes. Perfect requirements from six months ago are no longer perfect. As ice hockey great Wayne Gretzky says, “You have to skate to where the puck is going to be.” Change is inevitable, so every project must have a process to manage change.

*Ineffective schedule planning and/or management.* Project scheduling processes are the concern of four of the 17 top-rated EWSs in Table 2, and these were combined into one of the dominant dozen. Every journey consists of many steps. If project milestone deliverables and due dates are not documented, there will be multiple opinions about what needs to get done and when. A project team must understand and agree on what short-term tasks must be accomplished to get to the long-term objectives. Various skills and resources are needed at different times. Later, tasks often depend and build on the successful completion of earlier

tasks. Completing a project on time requires that all the project team members have a consistent understanding of the intermediate milestones, deliverables, and due dates that must be met to reach the overall objectives. Similarly, no status reporting process means that no stakeholder or team member has a way to know if tasks are on schedule or late. Because later tasks depend on the completion of earlier tasks, a project that does not know its status has no realistic chance of being completed on time or on budget.

A project needs to be estimated from the bottom up by determining what steps depend on prior completed steps and then estimating the time required for each step. The bottom-up schedule needs to be reconciled to the top-down project schedule. Although some tasks might be able to be done in parallel, there is some minimum amount of time the project will require. An arbitrary project deadline can ignore this minimum project time, but that does not mean it can be done in less than the required minimum. Another schedule-related EWS is when early project delays are ignored. One might expect that the first 10 percent of the project would be the smoothest part because initial tasks should be known, well planned, and not affected by problems from earlier tasks. Short-term assumptions should be quite accurate and change has not had time to occur. However, if the project kicks off late, planned resources are not committed on time, or other immediate delays occur, then it is illogical to expect that later tasks will go as planned or be completed earlier than planned to “make up the difference.”

*Communication breakdown among stakeholders.* Any significant project has multiple stakeholders and requires an ongoing choreography of various tasks and resources. Change over the life of the project is inevitable — business environment, competitor strategic and tactical moves, laws and regulations, management team, staff turnover, resource availability, and cost — to name just a few possibilities. If all stakeholders do not communicate and work together on an ongoing basis, the project team will be pulled in multiple directions. If consensus on project success criteria is lost, there may be little hope of completing the project on time and on budget, or perhaps of completing it at all.

*Resources assigned to a higher priority project.* If resources planned for the project get reassigned to another project it is unrealistic to expect the short-changed project to be

**P**rojects with a clear business case will typically get resources and management attention.

completed as planned. The only way this could occur is for the remaining resources to be utilized far more productively than planned. However, this is highly unlikely if the project was estimated on a “best-case” productivity basis to generate as high an ROI or payback as possible in the first place.

*No business case for the project.* No documented business case for a project is closely related to the top people- and process-related risks: lack of top management support and lack of project success criteria. Projects with a clear business case will typically get resources and management attention. The exception is “save the enterprise” projects, where survival is at stake and the enterprise will follow through with the project regardless of any economic business case.

### CONCLUSION

Successful IT project management is critical to enterprise success and to the career growth and success of participating executives, project managers, and project team members. This study identified a list of early warning signs of IT project failure, from which a dozen EWSs, or IT project risk factors, were found to be the most important during the first 20 percent of an IT project. Knowing about and paying attention to these EWSs — the earlier in the life cycle of a project, the better — increases the probability of successful project outcomes. Some projects should be stopped, because circumstances have changed or it was a bad idea to start with, and these EWSs can also help identify those situations before they become project “death marches” (Yourdon, 2003). Just as we notice the warning lights and gauges on the dashboards of our automobiles, paying attention to these EWSs during our project journey can help us avoid problems and successfully reach our destinations.

### References

- Barki, H., Rivard, S., and Talbot, J. (2001). An Integrative Contingency Model of Software Project Risk Management. *Journal of Management Information Systems*, 17 (4): 37-69.
- Bernstein, P.L. (1996). *Against the Gods: The Remarkable Story of Risk*. New York: John Wiley & Sons.
- Boehm, B.W. (1991). Software Risk Management Principles and Practices. *IEEE Software*, 8 (1): 32-41.
- DeMarco, T. and Lister, T. (2003). *Waltzing with Bears: Managing Risk on Software Projects*. Dorset House, New York.
- Havelka, D., Rajkuma, T., and Serve, P. (2004). “Early Indicators of Troubled IS Development Projects,” *Proceedings of Americas Conference on Information Systems*, New York, Aug 6-8.
- Jiang, J.J., Klein, G., and Ellis, T.S. (2002). A Measure of Software Development Risk. *Project Management Journal*, (33:3): 30-41.
- Jones, C. (2004). “Software Project Management Practices: Failure Versus Success,” *CrossTalk: The Journal of Defense Software Engineering*, October, 5-9.
- Jones, C. (2000). *You’re Worth Your Weight in Gold* at <http://www.projectmanagement.com/pm/article.cfm?ID=5665>, (April).
- Jones, C. (1995). *Patterns of Software System Failure and Success*; International Thomson Computer Press, Boston, MA.
- Keil, M. and Montealegre, R. (2001). Cutting Your Losses: Extricating Your Organization When a Big Project Goes Awry, *MIT Sloan Management Review*, 41 (3): 55-68.
- Kurzweil, R. and Grossman, T.M.D. (2004). *Fantastic Voyage: Live Long Enough to Live Forever*; Rodale Books, Emmaus, PA.
- May, L.J. (1998). Major Causes of Software Project Failures, *CrossTalk: The Journal of Defense Software Engineering*, July, 9-12.
- McFarlan, W. (1982). Portfolio Approach to Information Systems. *Journal of Systems Management*, January, 12-19.
- McKeeman, R. (2001). Early Warning Signs of Project Failure. Report for University of North Texas Information Systems Research Center.
- Schmidt, R., Lyytinen, K., Keil, M., and Cule, P. (2001). “Identifying Software Project Risks: An International Delphi Study,” *Journal of Management Information Systems*, 17, (4), 5-36.
- Standish Group. (2004). *CHAOS Report*. West Yarmouth, MA: The Standish Group International, Inc.
- Tiwana, A and Keil, M. (2004). The One-Minute Risk Assessment Tool, *Communications of the ACM*, 47(11): 73-77.
- Wallace, L., Keil, M., and Rai, A. (2004). How Software Project Risk Affects Project Performance: An Investigation of the Dimensions of Risk and an Exploratory Model, *Decision Science* 35, 2 289-321.
- Ward, J. L. (2003). “Recognizing Project Warning Signs,” available online at <http://www.esi-intl.com/public/publications/122003executivewarningsigns.asp>
- Winters, F. (2002). “The Top 10 Reasons Project Fail,” available online at <http://www.gantthead.com/article.cfm?ID=147229>
- Yourdon, E. (2003). *Death March: The Complete Software Developer’s Guide to Surviving “Mission Impossible” Projects*, 2nd edition. Prentice Hall, NY.

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